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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/753,323

01/09/2004

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08/09/2006

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EXAMINER

AL NAZER, LEITH A

ART UNIT

PAPER NUMBER

2821

DATE MAILED: 08/09/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/753,323	Applicant(s) LUKISHOVA ET AL.	
	Examiner Leith A. Al-Nazer	Art Unit 2821	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 January 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-127 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 64-126 is/are allowed.
- 6) ☒ Claim(s) 1-63 and 127 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 09 January 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.



TAN HO
PRIMARY EXAMINER

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>04/26/04, 01/13/05</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Drawings

1. New corrected drawings in compliance with 37 CFR 1.121(d) are required in this application because the drawings filed on 09 January 2004 are informal and are suitable only for examination purposes. Applicant is advised to employ the services of a competent patent draftsman outside the Office, as the U.S. Patent and Trademark Office no longer prepares new drawings. The corrected drawings are required in reply to the Office action to avoid abandonment of the application. The requirement for corrected drawings will not be held in abeyance.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 62 and 63 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 62 recites "the oxygen-depleted host". There is a lack of antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. Claims 1, 6, 8-10, 24-32, 38, 42, 43, and 127 are rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent No. 4,556,287 to Funada et al.

With respect to claims 1, 6, 8, 38, 42, and 127, Funada teaches a substrate (2 and/or 4); a single light-emitting dye molecule (8) or other, single fluorescence emitter; and a planar aligned liquid crystal host (6), disposed on the substrate, the light-emitting dye or other fluorescence emitter being embedded in the host, for aligning molecules of the light-emitting dye or other fluorescence emitters along a preferred direction.

With respect to claim 9, Funada teaches the host comprising biphenyl or terphenyl liquid crystals or mixture of biphenyl or terphenyl liquid crystals (column 5, lines 35-50).

With respect to claims 10 and 43, Funada teaches the single light-emitting dye molecules comprise a dye selected from the group consisting of terrylene, rhodamine, or a rhodamine derivative, Alexa Fluor, DiIC₁₈(3), and DiIC₁₈(5) (column 5, lines 35-50).

With respect to claims 24-32, Funada teaches preparing a substrate (2 and/or 4); preparing a planar aligned liquid crystal host (6), disposed on the substrate, for aligning

single molecules of a light-emitting dye (8) or other single fluorescence emitter along a preferred direction; and embedding the light-emitting single dye molecules or other single fluorescence emitters in the host (figure 1).

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

8. Claims 2, 5, 14, 15, 18-20, 33, 37, 47-49, 52, 56-58, 62, and 63 rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 4,556,287 to Funada et al. in view of U.S. Patent No. 5,989,758 to Komatsu et al.

With respect to claims 2, 5, 33, 37, and 47, Funada teaches a nematic liquid crystal (column 1, line 55 – column 3, line 25). Claim 2 requires the liquid crystal be monomeric, as well. Such a configuration is well known in the art, as is evidenced by

Art Unit: 2821

Komatsu (column 1, lines 18-42). At the time of the invention, it would have been obvious to one having ordinary skill in the art to utilize a monomer in the liquid crystal of Funada. The motivation for doing so would have been to provide a liquid crystal with fast response times to external conditions, such as an external electric field, as is suggested by Komatsu (column 1, lines 18-42).

Claims 14, 18, 19, 48, 52, 56, 57, 62, and 63 require the host comprise an oligomeric or polymeric liquid crystal or a mixture of oligomeric or polymeric liquid crystals. Such a configuration is well known in the art, as is evidenced by Komatsu (column 1, lines 18-42). At the time of the invention, it would have been obvious to one having ordinary skill in the art to utilize an oligomeric or polymeric liquid crystal or mixture of oligomeric or polymeric liquid crystals in the liquid crystal of Funada. The motivation for doing so would have been to provide a liquid crystal with desired response times to external conditions, such as an external electric field, as is suggested by Komatsu (column 1, lines 18-42).

With respect to claim 15, Funada teaches a the host comprising a nematic liquid crystal (column 1, line 55 – column 3, line 25).

With respect to claims 20 and 58, Funada teaches the single light-emitting dye molecules comprising a dye selected from the group consisting of terrylene, rhodamine, or a rhodamine derivative, Alexa Fluor, DiIC₁₈(3), and DiIC₁₈(5) (column 5, lines 35-50).

Claim 49 requires the host comprise a nematic oligomeric or polymeric liquid crystal or mixture of oligomeric or polymeric liquid crystals resulting in a predominantly nematic phase. Such a configuration is well known in the art, as is evidenced by

Komatsu (column 1, lines 18-42). At the time of the invention, it would have been obvious to one having ordinary skill in the art to utilize a nematic oligomeric or polymeric liquid crystal or mixture of oligomeric or polymeric liquid crystals in the liquid crystal of Funada. The motivation for doing so would have been to provide a liquid crystal with desired response times to external conditions, such as an external electric field, as is suggested by Komatsu (column 1, lines 18-42).

9. Claims 3, 4, 16, 17, 36, 50, and 51 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 4,556,287 to Funada et al. in view of U.S. Patent No. 5,989,758 to Komatsu et al. as applied to claims 2, 5, 14, 15, 18-20, 33, 37, 47-49, 52, 56-58, 62, and 63 above, and further in view of U.S. Patent Application Publication No. 2002/0000984 to Asai et al.

Claims 3 and 16 require the host be a chiral host. Asai teaches a chiral host (paragraph 0011). At the time of the invention, it would have been obvious to one having ordinary skill in the art to utilize a chiral host in the system as taught or suggested by Funada. The motivation for doing so would have been to control properties of the liquid crystal, such as reflectivity, as is suggested by Asai (paragraph 0155).

Claims 4, 17, and 50 require the host comprise a chiral additive. Asai teaches a chiral additive (paragraph 0011). At the time of the invention, it would have been obvious to one having ordinary skill in the art to utilize a chiral additive in the system as taught or suggested by Funada. The motivation for doing so would have been to control

Art Unit: 2821

properties of the liquid crystal, such as reflectivity, as is suggested by Asai (paragraph 0155).

Claim 36 requires the host be a monomeric host or mixture of monomeric hosts. Such a configuration is well known in the art, as is evidenced by Komatsu (column 1, lines 18-42). At the time of the invention, it would have been obvious to one having ordinary skill in the art to utilize a monomer in the liquid crystal of Funada. The motivation for doing so would have been to provide a liquid crystal with fast response times to external conditions, such as an external electric field, as is suggested by Komatsu (column 1, lines 18-42). Claim 36 further requires the host be a chiral host or mixture of chiral hosts. Asai teaches a chiral host (paragraph 0011). At the time of the invention, it would have been obvious to one having ordinary skill in the art to utilize a chiral host in the system as taught or suggested by Funada and Komatsu. The motivation for doing so would have been to control properties of the liquid crystal, such as reflectivity, as is suggested by Asai (paragraph 0155).

Claim 51 requires the host comprise a chiral oligomeric or polymeric liquid crystal or mixture of chiral oligomeric or chiral polymeric liquid crystals. Asai teaches a chiral oligomeric or polymeric liquid crystal or mixture of chiral oligomeric or chiral polymeric liquid crystals (paragraph 0011). At the time of the invention, it would have been obvious to one having ordinary skill in the art to utilize a chiral host in the system as taught or suggested by Funada and Komatsu. The motivation for doing so would have been to control properties of the liquid crystal, such as reflectivity, as is suggested by Asai (paragraph 0155).

10. Claims 7 and 39-41 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 4,556,287 to Funada et al. in view of U.S. Patent No. 5,334,424 to Hani et al. or U.S. Patent No. 6,037,471 to Srinivasa et al.

Claims 7 and 39-41 require the host be an oxygen-depleted liquid crystal host. Although not explicitly stated by Funada, it is well known in the art that high oxygen levels have a negative effect on liquid crystal stability, as is evidenced by Hani (column 5, lines 15-60) or Srinivasa (column 6, line 40 – column 7, line 45). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to take liquid crystal host of Funada and state that it should be oxygen-depleted. The motivation for doing so would have been to increase the stability and longevity of the liquid crystal host.

11. Claims 11-13 and 44-46 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 4,556,287 to Funada et al. in view of U.S. Patent No. 6,727,065 to Weiss et al. or U.S. Patent Application Publication No. 2003/0054356 to Jacobson et al.

Claims 11 and 44 require the other fluorescence emitter comprise a core-shell semiconductor nanocrystal. It is well known in the art that a semiconductor nanocrystal can be substituted for a given molecule, as is evidenced by Jacobson (paragraph 0063) and Weiss (column 8, lines 16-36). At the time of the invention, it would have been obvious to one having ordinary skill in the art to utilize a semiconductor nanocrystal in

the system as taught or suggested by Funada. The motivation for doing so would have been to provide substances with broader wavelength absorption bands, as is suggested by Weiss (column 8, lines 16-36).

With respect to claims 12 and 45, Weiss teaches the semiconductor nanocrystal comprises PbSe, CdTe, PbS, or CdS as core material (column 8, lines 40-55).

Claims 13 and 46 require the other fluorescent emitter comprise a trivalent rare-earth chelate. Jacobson teaches such a configuration (paragraph 0063). At the time of the invention, it would have been obvious to one having ordinary skill in the art to utilize a trivalent rare-earth chelate in the system as taught or suggested by Funada. The motivation for doing so would have been to provide substances with desired wavelength absorption bands.

12. Claims 21-23 and 59-61 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 4,556,287 to Funada et al. in view of U.S. Patent No. 5,989,758 to Komatsu et al. as applied to claims 2, 5, 14, 15, 18-20, 33, 37, 47-49, 52, 56-58, 62, and 63 above, and further in view of U.S. Patent No. 6,727,065 to Weiss et al. or U.S. Patent Application Publication No. 2003/0054356 to Jacobson et al.

Claims 21 and 59 require the other fluorescence emitter comprise a core-shell semiconductor nanocrystal. It is well known in the art that a semiconductor nanocrystal can be substituted for a given molecule, as is evidenced by Jacobson (paragraph 0063) and Weiss (column 8, lines 16-36). At the time of the invention, it would have been obvious to one having ordinary skill in the art to utilize a semiconductor nanocrystal in

Art Unit: 2821

the system as taught or suggested by Funada. The motivation for doing so would have been to provide substances with broader wavelength absorption bands, as is suggested by Weiss (column 8, lines 16-36).

With respect to claims 22 and 60, Weiss teaches the semiconductor nanocrystal comprises PbSe, CdTe, PbS, or CdS as core material (column 8, lines 40-55).

Claims 23 and 61 require the other fluorescent emitter comprise a trivalent rare-earth chelate. Jacobson teaches such a configuration (paragraph 0063). At the time of the invention, it would have been obvious to one having ordinary skill in the art to utilize a trivalent rare-earth chelate in the system as taught or suggested by Funada. The motivation for doing so would have been to provide substances with desired wavelength absorption bands.

13. Claims 34 and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 4,556,287 to Funada et al. in view of U.S. Patent Application Publication No. 2002/0000984 to Asai et al.

Claim 34 requires the host be a chiral host. Asai teaches a chiral host (paragraph 0011). At the time of the invention, it would have been obvious to one having ordinary skill in the art to utilize a chiral host in the system as taught or suggested by Funada. The motivation for doing so would have been to control properties of the liquid crystal, such as reflectivity, as is suggested by Asai (paragraph 0155).

Claim 35 requires the host comprise a chiral additive. Asai teaches a chiral additive (paragraph 0011). At the time of the invention, it would have been obvious to one having ordinary skill in the art to utilize a chiral additive in the system as taught or suggested by Funada. The motivation for doing so would have been to control properties of the liquid crystal, such as reflectivity, as is suggested by Asai (paragraph 0155).

14. Claims 53-55 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 4,556,287 to Funada et al. in view of U.S. Patent No. 5,989,758 to Komatsu et al. as applied to claims 2, 5, 14, 15, 18-20, 33, 37, 47-49, 52, 56-58, 62, and 63 above, and further in view of U.S. Patent No. 5,334,424 to Hani et al. or U.S. Patent No. 6,037,471 to Srinivasa et al.

Claims 53-55 require the host be oxygen depleted by treating the host to displace molecular oxygen dissolved in the host with another gas. Although not explicitly stated by Funada, it is well known in the art that high oxygen levels have a negative effect on liquid crystal stability, as is evidenced by Hani (column 5, lines 15-60) or Srinivasa (column 6, line 40 – column 7, line 45). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to take liquid crystal host of Funada and state that it should be oxygen depleted. The motivation for doing so would have been to increase the stability and longevity of the liquid crystal host.

Allowable Subject Matter

15. Claims 64-126 are allowed.

16. The following is a statement of reasons for the indication of allowable subject matter:

With respect to independent claim 64, the prior art of record fails to teach or suggest the combination of a photon source comprising two substrates, a single molecule of light-emitting dye or other single fluorescence emitter, and a planar aligned liquid crystal host; a light source of preferred polarization state; means for collecting emitted photons; and means for discriminating excitation light from emitted light. With respect to independent claim 95, the prior art of record fails to teach or suggest the combination of providing a source which comprises a substrate, single molecules of a light-emitting dye or other single fluorescent emitters, and a planar aligned liquid crystal host; providing a light source for causing polarized excitation light to be incident on a portion of the photon source; and discriminating the emitted light from the excitation light.

Citation of Pertinent References

17. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The following patent documents further show the state of the art:

- a. U.S. Patent No. 4,841,009 to Kelsey
- b. U.S. Patent No. 5,384,067 to Doane et al.

Art Unit: 2821

- c. U.S. Patent No. 5,552,915 to Khoo
- d. U.S. Patent No. 6,239,778 to Palffy-Muhoray et al.
- e. U.S. Patent Application Publication No. 2002/0008841 to Ohmuro
- f. U.S. Patent Application Publication No. 2002/0146052 to Moerner et al.
- g. U.S. Patent Application Publication No. 2003/0152228 to Gerard et al.
- h. U.S. Patent Application Publication No. 2004/0218649 to Moerner et al.

Communication Information

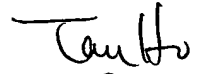
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Leith A. Al-Nazer whose telephone number is 571-272-1938. The examiner can normally be reached on Monday-Friday, 7:30-4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Callahan can be reached on 571-272-1740. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2821

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

LA


TAN HO
PRIMARY EXAMINER